2 March 1964

PERFORMANCE REQUIREMENTS FOR

SPECIFIC FORMAT CHIP PRINTER

1. SCOPE

1.1. Performance Requirements.

These performance requirements cover the general specifications for a high performance, step and repeat printer capable of producing duplicate exposures of specific formats containing the highest possible quality, resolution and acutance.

1.2. Development Plan.

The development of this printer shall be carried out in three phases as follows:

1.2.1. Preliminary Design. The preliminary design phase shall consist of investigation and study to determine approach and should include but not be limited to such areas as lenses versus light sources for optimum performance, transport methods, film gates, automation, resolution, etc. The contractor shall submit an investigative type report thirty days after award of contract containing the characteristics and components to meet the performance requirements specified herein and proposed methods of accomplishment.

1.2.2. Breadboard Phase. The breadboard phase shall demonstrate and prove the concepts proposed in the preliminary phase. Breadboarding shall be reviewed and approved by the contract monitor prior to any printer fabrication. Approved design drawings of the proposed final design shall be a part of the breadboard phase (see 6.1.1.).

1.2.3. Fabrication and Testing. The fabrication and testing phase shall encompass final design, assembly, test, training and acceptance of the deliverable product.

2. REQUIREMENTS

2.1. Input Materials.

2.1.1. Negative roll film or up to 500 foot lengths, 70mm through $9\frac{1}{2}$ inches in width with formats varying from 70mm by 70mm to $9\frac{1}{2}$ inches by 50 inches and 70mm through $9\frac{1}{2}$ inch roll film negative continuous strip type. Thickness variances from thin base (0.003") through heavy base (0.0075").

2.2. Output Materials.

2.2.1. Five inch dupe positive film of a specific format containing a contact image area, security classification and a human-machine readable code.

2.2.2. Format size (final cut size) shall be five inches (standard stock width, 4.96" $\pm$ 0.010") by 100mm (see Attachment A).

2.2.3. The contact image area size shall be variable, 70mm by 95mm, 90mm by 95mm or 112mm by 95mm, dependent upon user's requirement as to the size printed.

2.2.4. Security classification shall be printed at two locations. In the 90mm size and the 112mm size, the security classification will overprint the contact image (see Attachment A).

2.2.5. The human-machine readable code shall be printed across one end of the format (see Attachment A).

2.2.6. A fiducial marking system shall be employed to identify the center position of the contact image and shall be printed in the image format at all sizes (70mm x 95mm, 90mm x 95mm or 112mm x 95mm - see Attachment A).

2.2.7. The printer shall be capable of printing from any portion of the input material.

2.2.8. Optical sensing marks shall be exposed at the end of each format which will allow optical sensing by a cutter to precisely cut the film to the proper format if roll film output is a consideration.

2.2.9. The print stock thickness will vary from standard dupe film up to [redacted] emulsion safety film.

25X1A

2.3. Input Information.

2.3.1. Auxiliary data to be printed on the format shall be security classification (two locations), an identifying accession number consisting of up to forty-six (46) alpha-numeric characters and a corresponding machine-readable code (Manchester or similar).

2.3.1.1. The input information shall be by an internal code generator operated from an external keyboard or paper tape input and shall consist of the following character identifiers:

	EXAMPLE
Installation Identifier - two characters	10
Mission Identifier - eleven characters	903912A1206
Date - six characters	181263
Enlargement Factor - two characters	14
Geographic Coordinates - eleven characters	6147N10132E
Photo Frame Reference - ten characters	+2634-1258
Orientation - four characters	1693
Total - 46 characters	

Input information under Photo Frame Reference and Orientation shall be used to automatically position the printer raw stock relative to the input negative after indexing by the operator (see Attachment B).

2.3.2. Provision shall be made for viewing the image area to be printed prior to printing to assure alignment of fiducial marks and rotation (azimuth). A compass rose or other visual means of checking azimuth shall be employed.

2.4. Print Copies.

2.4.1. Operator selection of from one to fifteen copies shall be possible. Upon completion of the print cycle, the printer shall automatically

advance and position the unexposed film from the tape input or manual input, register the film-slide (dependent upon the image area size desired), sense the required exposure, expose the image, transport the film to the auxiliary data exposure station and expose that data. This action will automatically continue until the desired number of identical exposures are made.

2.4.2. Output rate shall be ten exposures per minute in the identical exposure mode.

2.4.3. The printer shall be capable of daylight operation.

2.5. Transport System.

2.5.1. Provision shall be made to transport and print from single rolls of input materials varying from 70mm through 9½ inches in width. Consideration shall also be given to handling two rolls of 70mm and five inch width input material (see 2.1.1.).

2.5.2. The transport system shall drive and take-up in the single roll mode in either direction so that at completion of printing the negative input roll is respooled in the same manner as received. The same requirement applies to the dual roll mode except the two rolls may be transported in opposing directions simultaneously.

2.5.3. Provision shall be made for two-step super-imposition printing with 180° orientation in either direction, divided into 1/10 of one degree increments. One station shall provide the image printing, fiducials, masking and optical sense marks while the second station provides the human-machine readable code and security classification. Other feasible printing combinations shall be considered.

2.5.4. Film cleaning stations of the static eliminator and rotating brush types shall be provided and located at the entrance to the film gate. Vacuum cleaning or other means shall also be considered.

2.5.5. Constant balance and tension on the supply and take-up systems by means of weighted tension arms with servo controls on film spool torques or similar methods shall be employed to prevent slippage of one film relative to the other when going into and through the film gate.

2.5.6. An adjustable millimeter counter on input materials shall be a part of the transport system.

2.5.6.1. This counter shall be capable of a 1000 count of frames from 70mm to 50 inches.

2.5.7. An adjustable X-Y measurement system accurate to ± 1mm over 15" shall be provided. Both positive and true negative values are required.

2.5.8. A six-digit non-resettable counter for counting the total life-time recycling shall be provided.

2.5.9. Consideration shall be given to automatic threading of input material.

2.6. Automatic Exposure Control.

2.6.1. Automatic exposure control shall be incorporated in the printer which will sense the desired image area densities over the range of 0.3 to 1.8 units, and shall automatically adjust the exposure conditions to provide the optimum prints.

2.6.2. Provision shall be made for by-passing the automatic exposure control and allow manual control at fixed exposure settings. The manual control shall be adjustable over the range of 0.10 to 10.0 seconds exposure.

2.6.3. A visual signal shall indicate the type mode of operation.

2.6.4. Automatic dodging in conjunction with automatic exposure control is desired.

2.7. Resolution.

2.7.1. The printer shall provide maximum modulation transfer function in terms of the modulation transfer characteristics of the reproduction materials.

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2.7.2. The printer shall be capable of consistently producing exposures of not less than [redacted] from original targets of 1000:1 contrast ratio

25X1B

and resolving a minimum of [redacted] This resolution requirement shall apply over the entire format of each specified size.

2.8. Frame and Housing Assembly.

2.8.1. The frame and housing assembly shall contain all the assemblies and components necessary for operation and shall maintain all parts in proper alignment to assure reliable and precise operation.

2.8.2. Isolation from and prevention of vibration harmful to optimum performance shall be a part of this requirement.

2.8.3. All access panels and controls shall be equipped with suitable interlocks to reduce human error. Indicator lights to indicate various stages of system readiness and/or malfunctions shall be employed.

2.8.4. The printer shall be so constructed to fit through a normal 36 inch door and be no longer than 96 inches. Modular design shall be considered.

2.8.5. The printer design and fabrication shall exhibit the highest possible degree of human engineering consistent with the specified requirements.

2.8.6. Pressurization with filtered air shall be a consideration if it is felt necessary for optimum performance.

2.9. Electrical Characteristics.

2.9.1. The printer shall be provided with suitable circuit breakers to prevent damage in event of electrical failure.

2.9.2. All wiring shall be color coded to permit circuit tracing.

2.9.3. A circuit diagram shall be permanently affixed to an accessible interior panel.

2.9.4. Proper and adequate voltage stabilization shall be provided where required to assure consistent and stable operation.

2.9.5. Radio interference suppression shall be in accordance with MIL-S-11748.

2.9.6. A plate showing electrical data shall be securely affixed in a conspicuous place near the outlet of the main power supply card.

2.10. Splice Accommodation.

2.10.1. The printer shall accommodate film rolls with film splices of the type normally used by principle manufacturers of aerial film and good quality hand splices.

2.11. Newton Rings.

2.11.1. Provision shall be made to prevent contact markings or Newton Rings from affecting the photographic quality of the output.

2.12. Film Handling.

2.12.1. The printer shall not damage the film base or emulsion of original, negative or print material in any manner whatsoever, including damage that may be caused by static electricity.

2.13. Dimensional Stability.

2.13.1. There shall be no undue strain applied to the input negative film or the print stock at any point in the transport or print cycle.

2.13.2. The use of cut film print stock shall be considered as an alternative to roll film stock. However, handling systems (cassettes, transport, etc.) shall be thoroughly detailed in the preliminary design phase.

2.14. Reliability.

2.14.1. The printer shall be designed for a 90% duty cycle. The

printer shall further operate satisfactorily and properly in all respects for a period of not less than ten consecutive hours without malfunction or breakdown as a part of pre-shipment tests.

2.15. Service Life.

2.15.1. The printer shall be designed to withstand operating service usage, under normal operating conditions, for a period of 5000 cumulative hours without degradation of performance, and with only minor maintenance due to normal mortality of expendable replacement parts.

2.16. Light Source.

2.16.1. The light source (and optical system) shall be designed to initiate the maximum latent image capability of the current highest quality silver-halide, diazonium and polymer sensitized reproduction materials respectively. It shall be of adequate but not excessive band width to accommodate these materials.

2.16.2. Evenness of illumination shall be a part of this requirement. There shall be no visible streaking whatever. Optical compensators or correction to achieve even illumination shall be a consideration provided there is no resultant degradation in quality, resolution and acutance. Testing shall include standard flash printing to verify uniformity.

3. TEST PROVISIONS

3.1. Test Plan.

3.1.1. The contractor shall prepare and submit to the project monitor for approval a detailed test plan sixty (60) days prior to completion of the printer. This test plan shall specify and describe in detail those tests to be conducted at the contractor's plant to determine conformance with requirements. The project monitor reserves the right to modify or amplify the test plan to assure complete and adequate testing.

3.2. Test Materials and Equipment.

3.2.1. The contractor shall provide all test targets, test film and test instruments to adequately demonstrate fulfillment of performance requirements. All test materials and equipment shall be detailed in the submitted test plan for approval.

3.3. Pre-Shipment Tests.

3.3.1. Testing as set forth in the approved test plan shall be conducted by the contractor at his facility under the direction of the project monitor.

3.3.1.1. A detailed report of the tests performed and results of same shall be delivered with the printer.

3.3.1.2. A daily log on operation and performance of the printer shall be maintained commencing at the time pre-shipment tests begin. This log shall detail operational hours, down time, causes of down time, fixes, etc., and shall be a permanent type, affixed to or accompanying the printer at all times.

3.3.2. Approval of pre-shipment test results shall not constitute final acceptance.

3.4. Acceptance Tests.

3.4.1. Acceptance testing shall be performed at the delivery destination and will include, in addition to any or all tests detailed in the test plan, a 30 day normal operation period under production conditions.

4. TRAINING.

4.1. Contractor's Facility Training.

4.1.1. A comprehensive training period shall be conducted by contractor personnel at his facility for six Government personnel. This training shall include but not be limited to the theory of operation,

practical operation, maintenance and trouble-shooting and shall encompass optical, mechanical and electronic application.

4.2. Destination Training.

4.2.1. The contractor shall designate one engineer who is thoroughly acquainted with all operational aspects of the printer to remain at the delivery destination for the duration of the acceptance testing. Operational training will be a part of his duties.

5. SPARE PARTS

5.1. A recommended spare parts list shall be submitted by the contractor sixty (60) days prior to delivery. Vendors, pricing of components and a recommended six-month stock level shall be included. It shall be the perogative of the project monitor to use this as a shopping list for contractor procurement of approved items.

6. DRAWINGS

6.1. Design Drawings.

6.1.1. Design drawings depicting all facets of the proposed design shall be submitted to the project monitor for approval prior to the fabrication and testing phase. Fabrication of the printer shall not begin prior to approval of the design drawings.

6.2. Detailed Drawings.

6.2.1. A complete set of detailed manufacturing drawings, including a drawing index and a complete list of parts, shall be furnished as an end item. These drawings shall conform to good commercial practices and shall be complete in all details.

7. MANUALS

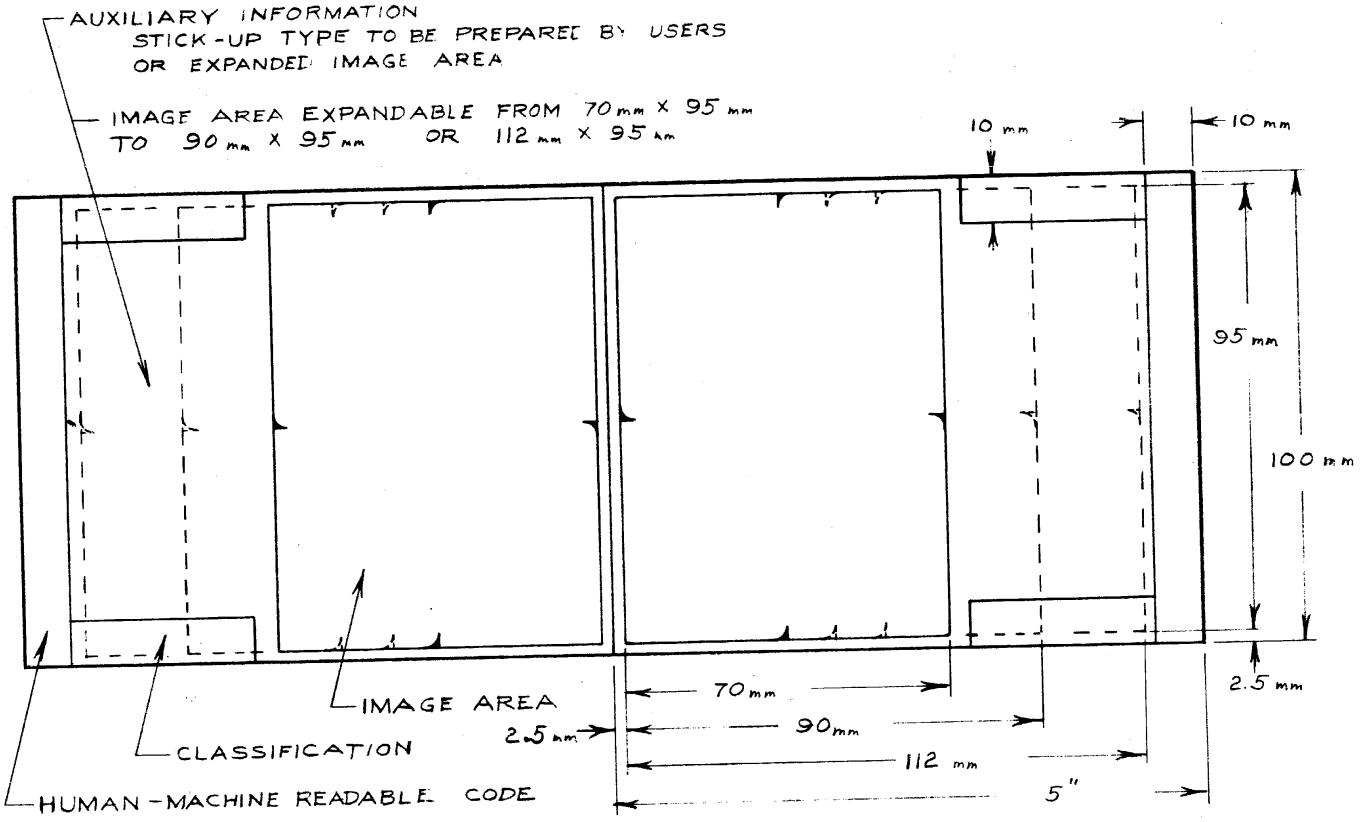
7.1. Operational and Maintenance Manual.

7.1.1. Ten (10) copies of an operational and maintenance manual shall be provided with the printer. The manual shall describe all operational characteristics and normal maintenance and repair procedures.

8. DELIVERY

8.1. Delivery shall be as specified in the procurement document.

PATENT NOTICE: When Government drawings, specifications or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.



SECRET

SECRET

Attachment B

INSTRUCTIONS CONCERNING THE PROPOSED CHIP ACCESSION NUMBERING SYSTEM

1. DESCRIPTION:

This numbering system, the outgrowth of numerous users' recommendations, is for use within this Agency only and has no likeness to that accession numbering system recommended by DIA. This unique number for each chip is assigned at the time of chip production and is generated to serve a two-fold purpose. Current efforts toward a computer derived mensuration capability dictate that sufficient information be contained within the accession number to enable measurements to be made on the chip. The other, possibly a far-looking purpose, is unique identification of each chip to allow automatic or semi-automatic storage and retrieval.

Position within the accession number:

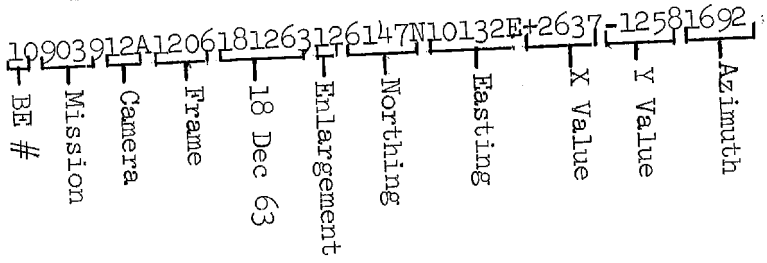
1, 2	Installation Identifier - two characters	
3, 4, 5, 6	Mission	Mission Identifier - eleven characters
7, 8, 9	Camera	
10, 11, 12, 13	Frame	
14, 15, 16, 17, 18, 19	Date - six characters	
20, 21	Enlargement Factor - two characters	

22 23 24 25 26 27 28 29 30 31 32 — Geographic Coordinates of Target - eleven characters

33 34 35 36 37 38 39 40 41 42 — Photo Frame Reference - ten characters

43 44 45 46 — Orientation - four characters

Example as read on the chip:



2. INSTRUCTIONS:

The 46 characters will be written as shown in the example above and will be generated either by paper tape or manually for a code generator internal to the chip printer.

a. BE Code Number. The first two digits of the applicable Bombing Encyclopedia Code Number shall be used to identify the type of installation and shall always be written with two digits from "01 through 99". "00" shall be used if the type installation is undeterminable.

b. Mission Identifier. The mission identifier will be derived from the original photo frame and shall be written with eleven digits: the first four allocated to mission "0001 through 9999"; the next three to camera "001 through 999", substituting letters for numbers where applicable; and the last four allocated to frame number "0001 through 9999".

c. Date. The date shall be the date of the original photo frame. The day of the month shall be written first in the six digit sequence with two digits from "01 through 31". "00" shall be used if the actual day is unknown. The month of the year shall be written similarly from "01 through 12". Only the last two digits of the year shall be used.

d. Enlargement Factor. The enlargement factor shall be the enlargement applicable to the chip and shall always be written with two digits. Contact or 1:1 shall be shown as "01", 2X as "02", 4X as "04", etc.

e. Geographic Coordinates. Geographic coordinates shall always be written with eleven characters, representing the coordinate position of the target to the nearest minute with the associated northing-easting letter symbol. Substitution of "0" shall be made where required (1°30'N, 40°02'E, written as 0130N04002E).

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f. Photo Frame Reference. The photo frame reference consists of ten digits representing the X-Y distance from the target center to the principle point of reference on the original frame. It shall consist of a ±X value in

[redacted]

g. Orientation. Orientation consists of four digits representing the number of degrees from the chip orientation to the top edge or other reference position of the original frame. It shall always be a plus value, reading clockwise, and carried out to the nearest tenth of a degree. Substitution of "0" shall be made where required (16.4°, written as 0164). The decimal is dropped and the last digit represents tenths of a degree.

3. OTHER INFORMATION:

It is planned to allow sufficient area on the chip itself for local use. This can be by acetate inks or typed adhesive labels. Investigation has disclosed that the users would like city or country names, map references, mosaic references, time, etc., shown on the chip. This can be done by adhesive labels as the information is not pertinent to a mensuration requirement or storage and retrieval. Security classification and fiducial markings will also be printed on the chip.

4. MACHINE READABLE CODE:

Application of a machine readable code block corresponding to the alphanumeric code is also planned to allow computer provided mensuration readout.